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State Manual Training Normal School

THE TECHNE

Life without Labor is a Crime, Labor without Art and the Amenities of Life is Brutality.—Ruskin.

FEBRUARY, 1924

New times demand new measures and new men;
The world advances and in time outgrows
The laws that in our fathers' day were best;
And, doubtless, after us some purer scheme
Will be shaped out by wiser men than we,
Made wiser by the steady growth of truth.
The time is ripe, and rotten ripe, for change;
Then let it come; I have no dread of what
Is called for by the instinct of mankind.
Nor think I that God's world would fall apart
Because we tear a parchment more or less.
Truth is eternal, but her effluence,
With endless change, is fitted to the hour;
Her mirror is turned forward, to reflect
The promise of the future, not the past.

—*James Russell Lowell*

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VOL. 7 No. 2

THE TECHNE

Published by the KANSAS STATE TEACHERS COLLEGE OF PITTSBURG,
Pittsburg, Kansas.

W. A. Brandenburg, President.

VOL. 7 FEBRUARY, 1924 No. 2

The purposes of this magazine are: To set forth the distinctive work of this College; to publish papers that will be of interest to its readers; to assist teachers to keep in touch with the development in their subjects; to foster a spirit of loyalty that will effect united action among the alumni and former students in promoting the best interests of the institution.

Alumni, teachers and friends of the College are invited to send communications on such subjects as fall within the scope of the magazine.

Sent free to all alumni and students and to teachers, school officials and citizens on request.

Entered as second-class matter December 13, 1917, at the post office of Pittsburg, Kans., under the act of August 24, 1912.

The editors will welcome suggestions from TECHNE readers. Their desire is to make this little magazine helpful to teachers. Tell us how we can make it of greater service to you. Tell us what YOU want.

CONTENTS

THE ORGANIZATION OF A MATHEMATICS CLUB

AGNES CROW, *Critic Teacher, Junior High School*

No doubt every teacher of secondary mathematics feels that one of his important problems is that of arousing and holding the interest of his pupils in mathematical work.

It was formerly thought that medicine to be effective must be unpalatable, but fortunately that day is past in the practice of medicine. It is equally true that the day has gone by in which arithmetic and algebra are to be regarded as bitter pills, to be reluctantly swallowed, if one would not have them hypodermically injected through the medium of a birch rod. Today every real teacher seeks to secure the attention of his students by presenting the subjects they are studying in an attractive form, and to instill it if possible by processes agreeable to the student.

Due to the great variety of mental capacities in the class room, it is practically impossible to arouse the dull and indifferent student from his lethargy, and at the same time keep the bright student working at concert pitch.

By assigning extra work to the more ambitious student and employing various other devices to retain the interest, it is impossible to bring out the capacity of every individual student. Yet we owe it to the excellent pupil to hold his interest, to stimulate his enthusiasm and to open up to him new fields of thought and to inspire him to the development of mathematical power of which he may be unconscious. While some of these objects may be accomplished in class room work, every enthusiastic teacher feels that his opportunities for inspiring the really capable student are much too limited.

The mathematics club is at least a partial solution of this difficulty.

The first mathematics club organized in a secondary school was the one in Shattuck Military Academy in Minnesota by Prof. Chas. Newhall, in 1903. Mathematics clubs until recently were more numerous in the eastern schools than other sections of the United States. I have become familiar with several through mathematical journals.

The only mathematics club with which I have been directly connected is the one in the Carthage, (Mo.) high school. I will describe our experiment in Carthage last year.

Our club came about through a desire to make a study of, and to investigate certain matters connected with mathematics, which do not properly find a place in the usual classroom work. When the possibility of organizing a club was proposed these pupils were very enthusiastic.

From the high school pupil's point of view, it was of course imperative that the club be equipped at the very outset with a constitution and by-laws, a name, a motto, and a pin. I doubt if any successful high school club could be organized without these important adjuncts, since all other organizations in high school have them. Officers consisting of a president, vice-president, secretary, treasurer and reporter were elected. A constitution was drawn up setting forth the aim: "to create an interest in and to further the study of mathematics." The organization was called "The Mathematics Club of the Carthage High School." It adopted as its motto: "B-2 and B-Ys," and the official pin was a circle of gold with an owl on a carpenter's square in bas relief, chosen from various designs submitted by members of the club.

The first members of the club were juniors and seniors, who had displayed unusual scholarship, interest, and originality in classroom work. The only membership re-

quirement being a grade of "M" or above in mathematics. At the end of the first semester all sophomores who had a grade of "S" or above were eligible to membership.

The club was proud of the fact that it was the only organization requiring scholarship as eligibility for membership. The scholarship requirement, to our knowledge, has never worked an injustice in excluding deserving students from membership. On the other hand knowing that a certain grade was the only qualification necessary for membership, often, was an incentive for a mediocre pupil to do better work.

Lack of uniformity in classification of the students did not seriously hamper the program committee in the selection of topics. For a sophomore to hear an occasional discussion of a trignometric solution by a senior, often stimulates his interest in the elective courses of mathematics.

Regular program meetings varying from an hour to an hour and a half in length were held every Wednesday after school.

The President appointed a program committee, which met with the teacher to arrange the programs. The program committee was quite dependent upon the teacher for the subject matter of the programs at first. Programs were made out a month in advance and announced so the student would have plenty of time to prepare his topic.

As students of high school age are new to investigations of the kind that we proposed, it was necessary to help them in the preparation of their topics. They were given explicit directions and suggestions how to treat a topic. They were given a brief outline, with references from books on certain pages and certain magazine articles.

The topics on the program were variously presented by different students. Some of them talked extemporaneously from notes, others marked certain paragraphs and read directly from books. Others prepared carefully written papers. Some placed diagrams and illustrations on the board and told from memory what they had read.

The plan of our meeting was that each report should consume from ten to fifteen minutes, and then at the close of the program there would be an informal discussion during which any one might ask questions or raise objections. If I could add anything of interest which had been brought out, I did so briefly, but the idea of the club was to have the members do most of the talking.

Of course we could consider only such subjects as would be intelligible to secondary school pupils; and then in a rather elementary and superficial way.

To give an idea of the various subjects considered in this mathematics club, it will be necessary to refer to some of the programs, and to describe the work of one or two of these meetings somewhat in detail, in order to show the scope of our investigations.

It was necessary to make the programs quite varied to maintain the interest of every individual member.

There were several types of programs. History programs, which are worthwhile and interesting if carefully planned and the right persons selected to prepare the topics. Mathematical recreations were the most popular type to he largest number of students. Construction problems proved to be quite interesting. Some simple topics of astronomy were discussed. Very little on the appreciation side of mathematics was discussed. One debate was given during the year on the subject, Resolved: "That the metric system of measurement should be adopted by the United States." Some very fine arguments were brought out on both sides.

All the debating clubs in the high school were having mock trials. It was suggested to the program committee that the mathematics club have a mock trial on something

relating to mathematics. An enormous amount of work was done by the club to keep the argument along mathematical lines, the results were quite gratifying.

At one of our meetings the time was devoted to "The Early History of Geometry." The three principal topics being:

1—The beginnings of Geometry.

2—Early Greek Geometry.

3—Golden Age of Greek Geometry.

In the first paper was considered the extent of geometrical knowledge among the early nations, the knowledge of astronomy among the Babylonians, and of mensuration and surveying among the Egyptians, the Ahmes value of pi, the rope stretchers, etc.

Early Greek Geometry was discussed by showing the marked tendency of the Greek mind towards logic and appreciation of form. Thales was referred to and the theorems attributed to him. There was also a biography of Pythagoras, and description of his school, and the brotherhood of the Pythagorians.

The golden Age of Greek Geometry was treated in a similar manner. Euclid and his works were discussed, something of his Elements, and its influence on the modern study of Geometry pointed out. Apollonius and Archimedes and a few later names were mentioned.

Another program was a study of "Curious Properties of Certain Numbers."

1—Numbers as 7, 9, 11, 35, etc.

2—Prime numbers and Eratosthenes Sieve.

3—Fermat's "Last Theorem" was stated and an example given.

A program which appealed to every member was, algebraic and geometrical fallacies.

1—Prove 1 equals 1; 1 equals minus 1; 1 equals 0, etc.

2—To Prove: An obtuse angle equals a right angle.

The one discussing the topic would propose the puzzle to the rest of the members, if they failed to point out the fallacy in a reasonable amount of time it was explained to them.

A program on the Pythagorean theorem and its proofs was given.

Number systems and numerals, which required a very definite outline, and a great deal of assistance in the preparation of individual topics, was another history program. Each person appearing in the discussion rehearsed his part to me. A meeting of this type to be a success must be carefully planned.

Puzzles and catch problems proved to be both pleasurable and profitable. Card tricks, problems on the chess board, etc. were used. One program during examination week, required each member to give a catch problem of any kind he chose. Another time each person came prepared to do paper folding or paper cutting. The result was each member learned to make a five pointed and a six pointed star, Greek Cross, Maltese Cross, Swastika, Jacobs Ladder, pine tree, etc. A list of suggested topics for programs will be found at the end of this paper, and a list of books and the publishers.

Concerning the social life of the club, a social meeting was held at the beginning of each semester or when new members were initiated. It was felt that an occasional social meeting results in greater spontaneity in the regular program meetings.

Usually every club is requested to give a program in chapel occasionally. A mathematics club wants to be true to its type and present a program of mathematical nature.

The following are suggested plays:

1—"Flatland," by E. A. Abbott.

2—Euclid Dramatized, (some valuable suggestions found in April, 1921. "School Science and Mathematics."

The most valuable results of the work of our club—it set the students to thinking. They found more things interesting in the dry subject of mathematics than they had dreamed.

Our investigations were not very profound, to be sure, and will result in no contribution to the sum of mathematical knowledge, but the students enjoyed the meetings, and I think profited by them. As these were the objects of the club, I feel that it proved itself worthwhile.

The following outline is given as offering suggestions for topics of discussion in mathematical clubs:

I.—Early History of Geometry
- 1.—The beginnings of Geometry
- 2.—Early Greek Geometry
- 3.—Golden Age of Greek Geometry

Source of Material: Allman's Greek Geometry from Thales to Euclid: Smith's teaching of mathematics; magazine articles.

II.—The History of Arithmetic and Algebra
- 1.—Among the Ancient Nations
  - (a) The Egyptians
  - (b) Greek arithmetic and algebra
  - (c) Roman arithmetic no algebra
- 2.—Among the Hindus and Arabs
- 3.—Early European arithmetic
- 4.—Developement of symbolic algebra
- 5.—History of common symbols of operation

III.—Number systems and Numerals
- 1.—Primitive systems of numeration
- 2.—Development of our decimal positional system.
  - a. Disadvantages of decimal as compared with duo-decimal system.
- 3.—History of Arabic numerals and other number symbols
  - a. Babylonian, Egyptian, Greek symbols (illustrate) Awkwardnessof Roman systems.
- 4.—Problems in other systems.
  - a. Multiplication tables in other systems
- 5.—Number systems of Algebra
  - a. Fractions: Egyptian unit fractions; Babylonian fractions - denominator always 60 Greek and Roman fractions.

Irrational Numbers, First use, brief history
Negative numbers " " " "
Imaginary numbers " " " "

RECREATIONAL TOPICS

I.—Numerical Puzzles (sharpening the wits)
- 1.—Perplexing questions
- 2.—Tricks
- 3.—Guessing numbers

II.—Mathematical Games
- 1.—Three in a row
- 2.—Games with counters
- 3.—Card tricks

III.—Trick Additions, Trick Multiplications.....
- 1.—Mental Cube Root.

IV.—Fallacies and catch questions

V.—Short cuts (for practical value)
- 1.—Squares and products of certain numbers
- 2.—Divisibility

VI.—Mystic Properties of Numbers
- 1.—Luck in odd numbers
- 2.—Fatality of certain numbers, Ex. 13
- 3.—Sacredness of certain numbers as 3-7
- 4.—Myths concerning numbers

VII.—Curious Properties of Numbers
- 1.—The number 9, 11, 35, 142857.
- 2.—The ten digits
- 3.—Perfect numbers
- 4.—Amicable numbers
- 5.—Triangular and figurate numbers
- 6.—Right triangular numbers
- 7.—Prime numbers and Eratosthenes Sieve
- 8.—Fermat's Last Theorem

VIII.—Numerical Curiosities
- 1.—Magic squares
- 2.—Pascal's triangle
- 3.—Combinations of the ten digits

IX.—Number Forms
- 1.—Sequence of numbers from 1-20, 1-100

X.—Time and its Measurement
- 1.—Calendars

XI.—First Notions of Numbers
- 1.—The beginning of Counting

XII.—Origin of Our Decimal System
- 1.—Due to our 10 fingers, use of counters.

XIII.—Numeration.
- 1.—Origin of names for numbers

XIV.—Primitive Number Systems
- 1.—Based on 5 and 20
- 2.—Other number bases ,12, 2, 60.

XV.—The Positional Idea in our Number System
- 1.—Invention of the symbol for zero
- 2.—Importance of the zero.

RECREATIONS IN ELEMENTARY ALGEBRA

I.—Algebraic Fallacies
- 1.—Prove 1-2, 1-0, 1-1
- 2.—Any No. —any other No.

II.—History of the Signs of Operation
- 1.—The various devices used at various times to denote plus, minus multiplication, division, equals, etc.
- 2.—The date of adoption of the present signs.

III.—Games of Chance
- 1.—Systems of Monte Carlo
- 2.—Probability curves
- 3.—Theory of probability

IV.—Large Numbers

RECREATIONS IN GEOMETRY

I.—Famous Problems of Geometry
- 1.—Squaring the circle
- 2.—The trisection of an angle
- 3.—Duplication of the cube
- 4.—Regular polygons

II.—Famous Theorems of Geometry
- 1.—Archimedes cylinder and sphere
- 2.—Hero's triangle

3.—Pon's asinorum
4.—Euler's theorum
5.—Feurbach's theorum

III.—Puzzles, Tricks, and Games
1.—Problems of a chess board
1.—The knight's Move
2.—The eight queens

IV.—Good luck symbols
1.The swastika
2.—The monad
3.—The cross
4.—The Greek cross

V.—Measuring Instruments
1.—Including mediaeval devices for measuring heights and distances.
2.—Modern methods transit, sextant, range finder, etc.

VI.—Mensuration of Unusual Areas and Solids
1.—A barrel, an anchor ring, the flow of a river
2.—Application of Simpson's rule
3.—Prismoidal formula, etc.

VII.—Mathematical Machines
1.—Planimeter, pantograph, slide rule
2.—Linkage for drawing a straight line
3.—Other linkages
4.—Devices for drawing ellipses, parabolas, etc.

VIII.—Higher Planes Curves
1.—Spirals, involutes, cycloids (their uses in mechanics as the curves of cams, gears, parabolic reflectors). Also the cissoid conchoid and the conics as devices for squaring the circle, trisecting an angle, etc.

IX.—The Mathematics of Common Things
1.—The watch as a compass
2.—Sun dials, the carpenter's square.
3.—Telescope, compound mirrors, maps in various projections, the four color theorem, a New System of planting corn, land descriptions etc.

X.—Optical Illusions
1.—Familiar examples, how we see solids illusions in Greek architecture

XI.—Unicursal Paths
1—Mazes, rules for threading a maze Euler's problem of the seven bridges The Hamiltonian game

XII—Paradoxes
1—Perpetual motion
2—Curve on a baseball
3—English on a billiard ball
4—Sailing faster than the wind
5—Why a machine may not be as strong as its model, etc.

XIII—Mathematical Symmetry in Nature and Art
1—Symmetrical forms in plants, leaves, honey comb, starfish, snowflakes, crystals.
2—Use of geometric forms in design, in architecture, etc.

XIV—The Human Side of Mathematics
1—Pictures of mathematicians, epigrams, epitaphs, anecdotes.

XV—A World Without Mathematics
1—Changes in living and methods of thinking
2—Change in the industrial world
3—Far reaching effects, if all mathematical knowledge was suddenly erased

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SUGGESTED BOOKS

1—Mathematical Recreations—Ball.
2—Mathematial Essays—Schubert, Open Court Publishing Co.
3—A Scrapbook of Elementary Mathematics—White, Open Court Publishing Co.
4—Mathematical Wrinkles—Jones, S. I. Jones, Gunter, Tex.
5—Cyclopedia of 5000 puzzles—Lloyd, Lamb Publishing Co.
6—Canterbury Puzzles—Dudeny, E. P. Dutton and Co.
7—Paradoxes of Nature and Science—Hampson, E. P. Dutton and Co.
8—Philosophy of Arithmetic—Brooks, Normal Publishing Co.
9—The Number Concept—Conant, Macmillan Co.
10—The Circle and Its Triangles (Pamphlet), D. C. Heath & Co.
11—The Hindu Arabic Numerals—Smith, Ginn & Co.
12—Memorabilia Mathematics—Moritz
13—Pictures of Mathematician—Open Court Publishing Co.
14—Famous Problems of Geometry—Ginn & Co.
15—In Algebra Land (Pamphlet)
16—Source Book of Geometry—Sykes, Allyn & Bacon
17—Famous Problems of Geometry (Rupert) (4 Pamphlets), D. C. Heath & Co.
18—The Number System of Algebra—Fine, D. C. Heath & Co.
19—The Teaching of Elementary Mathematics—Young, Longmans, Green & Co.
20—The Teaching of Geometry—Smith, Ginn & Co.
21—Euclid, His Life and System—Smith: Chas. Scribner's Son's
22—Non-Euclidean Geometry—Manning: Munn & Co.
23—The Fourth Dimension—Manning: Munn & Co.
24—Flatland (play) Abbott: Little Brown & Co.
25—Rara Arithmetic—Smith: Ginn & Co.
26—The Foundations of Geometry—O Hilbert: Open Court Magazine
27—The Fundamental Concepts of Algebra & Geometry—Young: Macmillan Co.
28—Monograph on Modern Mathematics—Young: Longmans, Green & Co.
29—The Thirteen Books of Euclid, 3 Vol.—Cambridge University Press
30—Euclid's Parallel Postulate—Withers: Open Court Publishing Co.
31—Scientific Romances—Hinton: Swan-Sonnenschien & Co.
32—Mensuration—Halstead: Ginn & Co.
33—Literary Lapses—Leacock
34—History of Mathematics—Ball.

THE "TRUE-FALSE TEST" IN PSYCHOLOGY

So many answers came in for our "True-False Test" in Psychology published in the December issue of the TECHNE that we are offering the following comments upon the answers received and upon the essential point in the "true" answer.

THE TEST STATEMENTS

1. Mental processes are never separate from brain action.
2. Therefore, mental processes and brain processes are identical.
3. Introspection enables one to observe another's mind.
4. There are about 12,000 neurones in the human brain.
5. The synapse is the threadlike part of a neurone.
6. Nerve impulses pass out from a neurone through the axone.
7. The cortex of the brain weighs about 48 ounces.
8. The visual area is near the fissure of Sylvius.
9. Brain cells increase in number until the age of nine.
10. A large number of instincts are acquired during childhood.
11. Instincts are not always a safe guide.
12. Instincts may be modified through punishment.
13. Instinct is an important factor in education.
14. It is never possible to distinguish an instinct from a habit.
15. Fear always comes from some unpleasant experience.
16. Fear should never be employed in education.
17. Curiosity is a desirable trait in children.
18. Imitation may be detrimental.
19. One may imitate unconsciously.
20. Play is a valuable aid to education.
21. The adolescent inclines to team play.
22. The instinct of ownership may be overdeveloped.
23. The instinct of rivalry should be completely suppressed.
24. A child inherits both bad habits and good ones.
25. One may have too many habits.
26. The majority of one's acts are habitual.
27. The college student acquires many habits.
28. One may have habits of thinking.
29. Habit assists me in answering these questions.
30. Sensations travel from the nerve ends to the brain.
31. There are more than five kinds of sensation.
32. Sensations of distance may be derived through the eye.
33. Color sensations result from stimulation of the cones of retina.
34. A color-blind person cannot see an apple if it is red.
35. Light is due to asmospheric vibration—186,000 per second.
36. Sunlight is a composite of colors.
37. Noise differs from tone in the rate of vibration.
38. A good ear may hear up to 769 trillion vibrations per second.
39. One might hear noises and not be able to hear tones.
40. There are only *three* primary tastes.
41. White is not a primary color.
42. Pain is not a kind of sensation.

43. The skin contains at least four kinds of sense organs.
44. Perception without sensation is impossible.
45. "The new-born babe perceives its mother's smile."
46. The deaf have no perceptions of distance.
47. Habit enters largely into our perceptions.
48. Every perception is an apperception.
49. Muscle sensations enter into all vision.
50. One's ears assist him in standing erect.

THE ANSWERS—ANNOTATED.

1.—True, according to present-day physiological and psychological opinion; false, however, according to Sir Oliver Lodge.

2.—False, according to all who hold to a dualistic view of the relation of mind and body. According to the Materialist it is true because "mind" is only a manifestation of matter, the brain. According to the Idealist it is true because he thinks of "matter" as only a manifestation of mind.

3.—False, because one can "introspect" (look into) his own mind but no other. One "observes" another mind *indirectly*, by the round-about route of physical actions, behavior.

4.—False, the estimates run into *billions*. Some place the number at twelve billions, i. e., 12,000 millions. No danger of a shortage.

5.—False, the *axone* "is the thread-like part." The synapse is contact point of the little filament tips of two neurones.

6.—True the axone is the "exit" for nerve impulse. The *dendrite* is the "entrance."

7.—False, the entire brain of the average Caucasian *man* weighs in the neighborhood of 48 ounces. Of the average woman a few ounces less, but this is nothing for you men to be bragging about.

8.—False, the visual area is in the "occipetal," that is, the back, part of the brain; the "fissure of Sylvius" is to the front on the sides.

9.—False, the *number* of brain cells does not increase. Their size, branchings, and total bulk do increase considerably till about that age, but not much afterward. The nine-year-old can pretty nearly exchange hats with his dad.

10.—False, instincts are not "acquired" at all. They are nature's endowment. Some are functioning at birth and some are "delayed" in their appearance, but are not *acquired*.

11.—True, despite Rousseau and a lot of "nature-worshipers" who hold that nature is perfect in all her ways. One need not look far to discover numerous examples of men and lower animals who "run amuck" under the "guidance" of instinct.

12.—True, sometimes the modification is for good, but sometimes not so. Most people are "punished" sometime and somehow to the extent of making different instinctive response to certain situations.

13.—True, perhaps no one questions this. What the child can do, what he wishes to do, and the way he does it are dependent more or less upon instinct.

14.—False, because it is sometimes possible, though at times impossible and often difficult. After early infancy, the child's actions are usually a compound of instinct and habit.

15.—False, it is sometimes instinctive and requires no experience as a prerequisite. A blind kitten will "sputter" at the odor of the dog as carried on human hands.

16.—False, because it is sometimes necessary to appeal to this motive. The abuse of the fear motive has led some people to say some foolish things in regard to this matter. The human being who "fears not God, man, law, disease, dishonor, nor any other thing" is not normal or is non-existent.

17.—True, but may be abused or misdirected.

18.—True, if overdone or turned to wrong examples.

19.—True, likewise conciously.

20.—True beyond question. Yet even this good thing may be abused.

21.—True, the three usual stages of play development are (1) "individualistic," or solitary; (2) "competitive;" (3) "group," or team play.

22.—True, because such over-development may lead to dishonesty, covetousness, stinginess, and kindred vices.

23.—False, because, if not overworked or dominated by improper emotional accompaniment, has great motive value.

24.—False, one does not *inherit* habits. He acquires them outright.

25.—True, thus becoming "a slave to habit" or losing his power of initiative. Usually, however, it is the strength and the kind of habit that makes for evil, rather than the number.

26.—True, both as to the total number of acts and as to the constituents of our acts. We do many things entirely from habit, many things largely from habit, scarcely anything, except in very early infancy, entirely free from habit.

27.—True, otherwise his college experience would be largely functionless for good or for evil.

28.—True, as to topics of thought, attitudes of thought, modes of thought, times of thought, intensity of thought.

29.—True, for the reasons noted in numbers 26 and 28.

30.—False, sensations do not travel, nerve-impulses do. Sensations *arise* in the brain because it is the "seat of Consciousness", live their short life there, die there, there they are buried, and there they may be resurrected, as memories. But travel? Never.

31.—True, sight, hearing, taste, smell, touch, and then temperature, pain, movement, digestive, etc, etc, at least a dozen in all.

32.—True, provided there *are* any "sensations of distance" at all. Some insist that we have only "percepts of distance," images of distance, thoughts of distance, memories of distance, etc, but not *sensations*. To a degree, therefore, the question is ambiguous. It is true that through the eye the mind derives the sensory materials from which these secondary forms of mental experience are developed. If it is correct to speak of "precepts of distance", it is equally permissible to speak of "sensations of distance". We are in deep water here

33.—True, according to best authority of today. The "rods" of the retina are the functioning organs for the sensations of "brightness," the colorless light.

34.— False, but he doesn't see it as *red*, it is probably gray to him.

35.—False, due to "ether vibrations"—whatever they may be—at an estimated rate of 450 to 790 *trillions* per second.

36.—True, the rainbow and the solar spectrum show what the components are.

37.—False, a noise and a tone may have the same rate. The difference is in the character of the two sounds.

38.—False, the average human ear hears only up to approximately 40.000 vi-

brations per second. A cricket *may* go considerably higher. Some people go as high as 50.000.

39.—True, such a person is "tone-deaf" as one might be "color-blind."

40.—False, there are four: salt, sweet, sour and bitter.

41.—True, it is a combination. See number 36.

42.—False, all psychologists agree to this. The "end-organs" for the stimulations which result in pain sensation can be located in the skin. Whether similar organs are distributed through the body is not known.

43.—True, light touch, heavy touch, heat, cold, pain, at least.

44.—True, because "perception is the interpretation of present sensations thru past experience", consequently without sensations there is nothing to interpret.

45.—False, although it sounds well. The babe lacks the past experience necessary to the intepretation noted in number 44.

46.—False, they can"preceive distance" (see number 32) through sight as well as through muscle and skin sensations.

47.—True, because the "interpretations" are made in our habitual ways. We "have our habitual ways of looking at things", as well as hearing them, tasting them, etc.

48.—True, according to common phraseology. This means that in every perception we *add to* the actual facts of the present sensory experience an element of past experience, hence *ap*-perception, literally *ad*-perception.

49.—True, because in every act of vision the eye muscles "get in their work" in spite of any effort we may make to the contrary. Were all eye muscles cut or paralyzed the muscle element would disappear.

50.—True, through the "sensations of equilibrium", or "balance", which are derived through the nerve-ends in the semi-circular canals of the ears. And these sensations figure in the maintenance of the erect position.

NOTE.—The usual formula for grading a paper of the "True-false" type is "R-W". With fifty questions this can be reduced to a percentage basis by making the formula read, (R-W) 2. Thus if of the fifty one has 9 wrong and 41 right, his score would be (41-9) 2, which gives 64.

BUILDING THE CURRICULUM—THE FACTORS INVOLVED

(From The Journal of the National Education Association)

The first step in curriculum construction is to discover the child's capacity for education, to understand what we have to start with, namely, the child himself, and then to visualize what we want him to become, in order that he may go out to serve life in terms of his own best self. The school no longer measures a child's worth merely by his capacity to achieve results in a prescribed course of study independently of his other powers. The modern educator realizes that it is the whole child that comes to school, that not merely minds, but bodies, emotions, attitudes, and unfolding ideals, all surge into the classroom to be developed and synthesized into an abundant life.

In other words, we are to measure or estimate a child's physical, social, and moral worth as well as his mental worth. As we take these measurements, the variation in the abilities, interests, and ambitions of children is found to be so great that it demands that courses of study be different to meet the needs of different groups of pupils. These varying groups may be in different schools in the same city or they may be in the same school. One group may be preparing for college matriculation

and looking forward to a professional career. Another group must be trained so that its members can work for the street-car company or run a banana stand. Some are of alien parentage and must be orientated in American life; others are of American parentage, but the ideals of Americanism are foreign to them.

The teacher—let it be understood that we refer to the teacher strengthened and reenforced by the best qualified supervision and administrators—must have a proper perspective and balance of values of the curriculum as a whole in relationship to the growth of the individual pupil. Sometimes it is only as the teacher follows the progress of her former pupils, that she realizes that subjects are not ends in themselves, to be pursued in logical order, but are merely means of enriching instruction. They are not all-inclusive, they only serve to point the way. It is the teacher with large vision who vitalizes the coures of study so that it becomes a means by which pupils grow and develop intellectually, morally, and socially, to the end that they may render proper service in school and in society. Very little in the course of study amounts to anything except as it blossoms in the classroom teacher's own thinking and life.

In emphasizing what is expected of the teacher, we sometimes forget the teacher herself. Her physical, social, and economic welfare are factors worth consideration. To insure the best service, the teacher should enjoy not only health and strength and a well-stored mind, but also a reasonable economic independence.

What are the aims and objectives of education? The next step in curriculum construction is to decide upon the general and specific aims and objectives of education. The following list is a compilation of the aims named most frequently. Some are restatements of the same thing.

General aims—Moral development or virtue, social efficiency, complete living, citizenship, individual development to the end that each live a happy and productive life, discovery and promotion of individual capacity, ability to adjust oneself to an ever-changing environment. Splendid ideals, but the classroom teacher sometimes wonders just what they mean. She wants them to be particularized.

Specifications: (1) Health and physical efficiency, including personal and community hygiene. (2) Command of fundamental processes, mastery of the tools of formal learning, such as reading, spelling, writing, drawing, number combinations, and social intercommunication, clarity and coherence of mind which best reveals itself in command of the use of language, both written and oral. (3) Worthy home membership, parental responsibilities and activities, the upbringing of children, and the maintenance of home life. (4) Vocational efficiency, practical skills which the individual is fitted by natural ability to take on, the labors of one's calling, together with an appreciation of the other man's job. (5) Social and civic efficiency, realization of the desire to be well thought of by one's fellows, intelligent participation in the solution of social and economic questions, activities involved in one's general social relationalships and behavior, together with those qualities which make for friendship and good neighborliness, and finally a realization that man's highest and most permanent ideal is service. (6) Worthy use of leisure, education for play and recreation, a vocational, efficiency, training for leisure, to the end that it may be used for enjoyment and enrichment of life, training for the enjoyment of nature, of literature, and of the fine arts in all their forms, a body of intellectual and cultural interests and contact with other cultures than his own through command of their languages. (7) Ethical character, conduct founded upon right principles, clearly perceived and loyally adhered to, an appreciation of the great moral values and

spiritual capital in the experience of the race. (8) Religious attitudes and activities. (9) Unspecialized practical labors, such as selecting, using, and making simple adjustments to the common mechanical devices for the home which modern civilization supplies. (10) General mental efficiency--its development and maintenance, ability to analyze problems, to concentrate atteention, to study effectively, and to do independent thinking, i. e., intellectual responsibility and independence, the discovery of knowledge through reading and information on scientific results and the methods by which they are achieved.

What are the purposes of the course of study?

(1) To guide the teacher in her work. The printed course of study is her handbook. It should help her to understand the purpose of school work—what things to teach in each subject and how to divide the time. In so far as it limits and restricts the individual expression of the thoughtful teacher, it is at fault; in so far as it aids the work and gives ample latitude to the strong it is helpful and worthwhile. As a guide it should encourage initiative and resourcefulness and inspire the teacher to her best thinking.

(2)—To coordinate all the efforts of the school to unify the work of the various grades as to aims and principles, and to enable each teacher to see her own work, not as a separate unit, but as growing out of the work of preceding grades, and leading to that which is to follow.

(3)—To provide a basis for classification and promotion, to make approximate assignments of work to be completed within given periods, and to establish standards of attainment which will help each teacher to keep in mind certain facts, habits, and skills which children in her class are expected to acquire, with ability to use these in situations requiring their use.

(4)—To encourage teachers to keep in mind the fostering of superior abilities with which some children are endowed; to help all children to work to their capacity.

(5)—To help teachers constantly to work toward the realization of those ultimate, thoughless tangible aims, namely: the cultivation, as by-products of all the required work, of certain habits, skills, interests, attitudes, appreciations, and ideals which promote not only the ability to make a living, but the ability to live abundantly.

What are the essentials? An analysis of the groups affected by the course of study, the aims in education, and the purposes of the course of study determines the curriculum, or the body of experience that can and should be communicated. Since children learn by doing, the curriculum should consist of pupil activities, carefully selected and arranged so as to bring about the desired outcomes in terms of knowledge, habits, skills, and attitudes.

Formerly the teacher's emphasis was on subjects, bodies of knowledge, accumulated through the thinking and experience of generations and arranged in logical order. These were doled out in daily portions to the pupil. From his viewpoint, it was largely a cold-storage process the idea being that at some future time he might need this information which at present had no connection with his daily life. Now subjects are looked upon as sources of material for enriching the child's activities and not as ends in themselves to be pursued in logical order.

In brief, the essentials of a course of study are: Statements of general educational aims and objectives, aims of particular subject courses and their relationship to the general purposes of education, outlines of pupil activities, subject-course references for both pupils and teachers, grade outcomes, and differentiation of material to

fit pupils of different levels of ability as well as standards of attainments measured by educational tests.

Who shall make the course of study and how? The selection and arrangement of pupil activities is not a one-man job. It is a problem beyond the wisdom of any one person. "The best course of study in any subject is possible only by pooling the leadership in that subject Leadership includes all those who have contributed. It includes: (1) the classroom teacher, (2) the supervisor, (3) the superintendent, who has made success in the subject administratively possible, (4) those in colleges or in bureaus of research, who are building the foundations of sound method by their in vestigations, and (5) those in colleges or normal schools who are directing the train ing of young teachers."

DIFFERENCES BETWEEN SUCCESS AND FAILURE

The Institute for Public Service, 423 West 120th Street, New York City, has published a small booklet entitled "Washington's 110 Maxims of Courtesy and Polite Behavior," written by George Washington when a boy thirteen years of age. The booklet sells for 10 cents with special prices for large lots. On the fly leaf are published the characteristics of graduates who are successes or failures as follows:

GRADUATES WIN FIRST AND BEST

(1)—Who are and seem happy, vital, brimful of the joy of living and of doing.

(2)—Who are "easy to look at" and to be with.

(3)—Who are noticeably clean and neat—hands, hair, face, clothes, shoes.

(4) Who have good posture, erect, rosy, and a voice pleasant to hear, low, soft, round.

(5)—Who are punctual in arriving, in coming when called, in starting when sent, and in returning.

(6)—Who are courteous and thoughtful to everybody, not merely to superior officers.

(7) Who are deferential to elders especially to parents and to persons responsible for their work.

(8) Who are ambitious to rise by proving their interest, ability and trustworthiness in the job and task at hand.

(9)—Who are reliable, to be trusted, willing and eager to carry responsibility.

(10) Who are teachable and studious, grateful for every hint which will show where their work or manner can be improved.

GRADUATES STUMBLE OR LOSE

(1)—Who are or seem unhappy or sullen.

(2) Who are hard to be with or to look at—who "Grate on the nerves' of fellow workers or employer.

(3)—Who are untidy, unclean of person or clothes, slovenly, careless, flashy, untastefully dressed.

(4)—Who are lop-sided, stoop shouldered, head drawn and ungraceful, stiff, "born tired," fidgety, shrill or loud or indistinct of speech.

(5)—Who are late in arriving, inattentive, slow in beginning, dawdling, shirking.

(7)—Who are not deferential to elders and official superiors especially at home where manners and attitudes and successes are made.

(8)—Who are gamblers wanting advancement without earning it by efficient work and conduct in today's job and task.

(9)—Who are not reliable, avoid responsibility, do only what is required, work well only when watched.

(10)—Who do not admit, and learn from their mistakes, are satisfied with the least their employers will tolerate, never volunteer or suggest, and resent evidence that their work and manner can be improved.

ABOUT THE CAMPUS AND IN THE FIELD

Miss Ethel Carder, a student in the commerce department, has accepted the position as secretary to Professor Guthridge, head of the Extension department of K. S. T. C.

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Mr. L. E. Curfman, assistant professor in the mathematics department, was re-elected president of the Crawford County Association of Reserve Officers at a meeting held Tuesday evening, January 22.

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The senior girls of the College proved to be real hostesses when they entertained the boys of their class at a Leap Year party given in Carney hall, Friday night January 18.

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C. W. Wright, former faculty member of K. S. T. C. who recently received his master degree from Columbia University at New York, has returned to the College, and is now teaching in the history department.

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Harold Kesling, former student of K. S. T. C., and Miss Frances Seem of Solomon, Kan., were married January 19. Mr. Kesling is now employed in Independence, Kan.

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George Furry, a former student in the electrical engineering department of K. S. T. C. is now an employee for the Missouri Battery company.

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The members of the senior class have selected "The Tailor Made Man," as their class play, to be given on May 8, under the direction of Miss Muriel Phillips of the dramatic art department.

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Miss Margaret Anshutz, who completed her work in the College the first semester for a life deploma in commerce, has accepted a position in Kansas City, where she will teach commercial work in a high school.

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A recital was given by the students of the music departments of the College on Thursday afternoon, January 17. This entertainment was one of a series the students plan to give in the future.

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Announcements of the marriage of Miss Dorothy Leib to Mr. Rees Hays, both of Pittsburg, have been received by friends. The wedding occurred Dec. 19, 1923, in Ft. Scott, Kan. Mrs. Hays is a student in the College, and will continue her work. Mr. Hays is an employee of the First National Bank of Pittsburg. The couple will make their home in Pittsburg.

Jim Gilbreath, who received a special certificate in industrial arts at the close of the first semester, has accepted a position as instructor in industrial arts in Chanute Junior high school.

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Pres. W. A. Brandenburg and Prof. S. L. Householder recently attended a banquet of former K. S. T. C. students now teaching in Kansas City.

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Miss Sullee Carver, a life certificate student of K. S. T. C. has accepted a position in the Fredonia public schools. Miss Carver will teach history and nature study.

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Miss Elsie Howard, who was a student in the College the first semester, is now teaching kindergarten in Oakley, Kan.

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Ralph M. Coffelt, instructor in linotype mechanism and keyboard operation of K. S. T. C., was a principal speaker at the convention of the Kansas Editorial association held in Wichita, January 19.

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Mark Brooks, who received his degree in industrial arts at the close of the first semester, has accepted a position as manual training teacher and basketball coach in the high school at Newkirk, Okla.

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Prof. J. A. G. Shirk, head of the mathematics department, delivered a series of lectures before the Franklin County Teachers association in Ottawa, Saturday, January 12.

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A Girls Reserve Training course for college girls will be conducted by Miss Frances Perry, national girls' work secretary of the Young Women's Christian association at the College, lasting from February 25-29.

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To accommodate and serve those whose schools do not close until the last week of April, or the first of May, provision has been made to enroll for four to five hours, depending upon date of enrollment. The plan is ample in every respect to meet the needs of all. Last year approximately two hundred teachers enrolled for the Spring Term, many of whom remained through the Summer Sessio nof nine weeks, and were able in this way to secure a whole semester's college credit. Even those who enter this year as late as May 1, and are willing to remain through both the Summer and the August sessions, will be able to make a whole semester's college credit.

ANNOUNCEMENT

The regular Summer Session of the Kansas State Teachers College will begin June 2 and close August 1. Students may earn college credit hours during the session not to exceed ten. The second or August Session of four weeks will begin August 4 and close August 29. Students may earn during this session not to exceed five semester college hours.

ONE-YEAR CERTIFICATES

A one-year elementary state certificate will be issued to applicants of good moral character who are not under eighteen years of age on the date of issuance of certificate, Sepember 1st, and who have completed a four-year course of study in a Kansas accredited high school, provided the applicant has completed at least 8 semester hours of residence college credit. This credit must be earned in the school year immediately preceding the year for which certificate is issued. Said one-year certificate is renewable once only, and upon conditions the candidate presents an additional 8 hours of college credit earned in residence during the year immediately preceding the year for which the renewed certificate is issued. All one-year certificates issued in compliance with the above regulation shall bear date of September 1st, and shall terminate on September 1st of the year following.

Never before have such large plans been made for the summer session. The large patronage of the last few years, and the splendid type of teacher who is taking advantage of the summer session for the improvement and the increasing of his professional equipment is, in the estimation of the management of the Kansas State Teachers College, justifying an ever-increasing outlay for the strengthening and improving of the session. The enrollment for the last summer session was approximately 2800, composed of those preparing for field of teaching activity. Many persons who had completed the work for their degrees were in the summer session doing work along special lines.

A vocational Educational Conference beginning June 9th, and continuing throughout the week with Dr. Chas. R. Prosser, Dr. L. S. Hawkins, and Dr. Arthur Dean, supplemented with lesser talent ought to attract the attention of hundreds of teachers desiring the most up-to-date and practical work in education. Other lecturers of hogh educational standing will appear on the summer school program from time to time.

Write for bulletin and full particulars,

W. A. BRANDENBURG, *President*,
Kansas State Teachers College,
Pittsburg, Kansas.

(THE BLANK BELOW MAY BE PASTED UPON A POSTAL CARD OR INSERTED IN A PROPERLY ADDRESSED ENVELOPE.)

PRESIDENT W. A. BRANDENBURG,
Pittsburg, Kansas.
Send Summer School Bulletin

Name .....

Address .....